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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/945,393	08/30/2001	Eugene P. Marsh	MI22-1728	3193

21567 7590 06/16/2006

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EXAMINER	
FOURSON III, GEORGE R	
ART UNIT	**PAPER NUMBER**
2823	

DATE MAILED: 06/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/945,393	MARSH, EUGENE P.	
	Examiner	Art Unit	
	George Fourson	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,20-24,26,27,35-38,45-49 and 53-56* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *20-24,26,27,35 and 45-49* is/are allowed.

6)☒ Claim(s) *1-7,36-38 and 53-56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-7,36-38 and 53-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Raaijmakers et al.

Raaijmakers et al exemplifies formation of tantalum oxide and tantalum pentoxide alternating layers by atomic layer deposition including formation of monolayers, chemisorption and annealing [0044][-124+] to produce a high-k capacitor dielectric, Raaijmakers et al discloses alternating monolayers of different metal oxides including forming a further dielectric layer on such a layer and including additional chemistries in each cycle [0055-0063] The reference discloses different ratios of different metals and binary cycles [0069]. The reference exemplifies formation of tantalum oxide and zirconium oxide [0072-0075][0106][0123-0124]). The reference exemplifies only two other metals – aluminum and titanium (tables I-VI). See [0057] where formation of a thinner layer 115 followed by further dielectric layers deposited by a similar ALD process is disclosed. See [0069] where different ratios of the different metals of a ternary dielectric is disclosed. See [0117] where it is disclosed that the process can be used to produce a slight doping effect as desired, See [0127] where it is disclosed that the process can be used to form dielectric stacks with enhanced dielectric properties and more stable structure (also see [0121]).

It would have been within the scope of one of ordinary skill in the art to form the recited alternating monolayers of tantalum oxide, zirconium oxide and optionally titanium oxide wherein the monolayers are evenly dispersed or dispersed as desired to produce a particular dielectric constant of the resulting dielectric layer in view of the disclosed suitability of tantalum containing and zirconium containing source

gases as the metal source gases, the disclosure of titanium as a suitable metal and the discussion related to use of different amounts of each component such as in creating a "slight doping effect".

In view of the disclosure that the amount of metals in the mixed metal oxide formed can be varied and that one of the aims of the variation is to produce dielectric stacks with enhanced dielectric properties, the same goal as that of applicant, one of ordinary skill in the art would have been led to the recited amounts of metal oxides in the dielectric stack produced.

Applicant argues that Raaijmakers fails to show forming layers comprising 3 different metals. However, the reference discloses that "the method can be adapted for complex metal oxides (e.g. first metal/oxygen/second metal/oxygen). Furthermore, the illustrated sequence can be extended to encompass more complex materials incorporating multiple elements. [0115]." The reference discloses that "in general, the process enables dielectric layers having mixed metal oxides, ternary metal oxide compounds, metal silicates, or more complex dielectric materials . For example, TiO.sub.2 can be mixed with Ta.sub.2O.sub.5 by alternating cycles. A largely binary cycle can be repeated several times between ternary cycles, if only a slight doping effect is desired [0117]." The use of "mixed metal oxide" and "ternary metal oxide compounds" in the same sentence here indicates some some inconsistency in use of the term "ternary". Note also the disclosure of a "binary cycle" between "ternary cycles". Also see [0151] "Referring now to FIG. 9, a bottom electrode 300 is schematically shown with an in-progress nanolaminate dielectric 302 conformally extending over an HSG silicon layer 304. The partially fabricated dielectric stack 302

preferably comprises about 3 .ANG. to 10 .ANG. of a first dielectric sublayer 302a (e.g., 5 .ANG. TiO.sub.2); about 3 .ANG. to 10 .ANG. of a second dielectric sublayer (e.g., 5 .ANG. Ta.sub.2O.sub.5); about 3 .ANG. to 10 .ANG. of third dielectric sublayer (e.g., 5 .ANG. TiO.sub.2); etc. As will be appreciated, several additional layers of the same or different construction can be added to complete a leakage-free memory cell capacitor "[0151]."

In view of this disclosure the use of the recited combinations of metal oxides would have Been within the scope of one of ordinary skill in the art.

Applicant argument that the reference fails to disclose advantages resulting from use of the recited amounts of metal oxides has been addressed in the office action mailed 1/20/06. In summary, it is not necessary for the reference to contain such a teaching. Applicant has not established that the recited amounts give rise to unexpected results. The reference indicates that the amounts of metals in the mixed metal oxide can vary over wide ranges including slight doping amounts and equal proportions to alter the dielectric properties of the resulting layer thus providing one of ordinary skill in the art a reasonable expectation of success in producing a useful dielectric layer using the recited metals and amounts of metals. It is not necessary that the reference provide a reasonable expectation of success in obtaining a property recognized by applicant. If applicant wishes to establish that inclusion of Zr provides unexpected results if must be clearly stated and based on objective evidence.

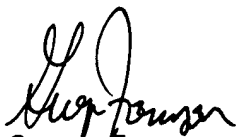
THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Fourson whose telephone number is (571) 272-1860. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



George Fourson
Primary Examiner
Art Unit 2823

GFourson
June 6, 2006